Comments from Jeremy Buck, U.S, Fish and Wildlife Service, Oregon Fish and Wildlife Office, Portland, Oregon on the June 26, 2020 *Draft Work Plan with Quality Assurance Project Plan for Smallmouth Bass Acoustic Telemetry and Tissue Sampling and Crayf*ish *Tissue Sampling* and the June 26, 2020 *Draft Work Plan with Quality Assurance Project Plan for Clam Sampling* at the at River Operable Unit, Bradford Island

July 30, 2020

Thank you for the opportunity for the U.S. Fish and Wildlife Service (Service) to review and comment on the salmon, crayfish, and clam Quality Assurance Project Plans (QAPPs) for the Bradford Island River Operable Unit (OU). Our comments are provided under separate headings below.

Purpose of Investigations

The primary reason for the collection of tissue samples from the site remains unclear. It appears there could be multiple questions addressed by the proposed Quality Assurance Project Plans (QAPPs). Are the primary purposes to:

- Gain better information to modify or support the Remedial Investigation risk assessment?
- Identify sources of Contaminants of Potential Concern (COPC)?
- Provide data to exclude COPCs?
- Further delineate nature and extent?
- Determine if the previous removal effort was effective in reducing COPC concentrations in tissue?

Based on data collected to date, the key remaining questions at the Bradford Island river operational unit (river OU) primarily relate to source identification, COPC exclusion, and developing background concentrations for COPCs. If sufficient number of samples are collected, then it may be possible to determine if changes in tissue concentrations over time have occurred, but background tissue concentrations would still be needed to determine when remedial activities are sufficient (or when any further investigations would add little value in answering primary study questions). Clarifying the purpose for tissue collection can be completed in Steps One and Two of the project quality objectives (listed in Table 3 of the QAPPs). Rather than list the primary study questions (PSQs) in Step One as is done in Table 3, we recommend stating the actual problem in a concise format (see Table 1 below for examples). The actual PSQs, along with the alternative actions for decision-making, can be then listed in Step Two of the project quality objectives in the form a concise statement (see Tables 1 and 2 below for examples). This format for data quality objectives follows guidance outlined in U.S. Environmental Protection Agency (2000). Formatting the first two project quality objectives in this way will greatly help clarify the purpose of the tissue collection and provide the possible alternative actions that would occur based on the results. This provides a basis for common understanding of the study purpose among the Technical Advisory Group members, promotes early dialogue before any data are collected, and is an important step in the systematic planning process.

Alternative Actions and Lines of Evidence
Sufficient data have been collected from the river OU to consider potential remediation actions and for guiding other decisions, and to determine alternative actions for any new data collected. The potential actions taken based on results of the data to be collected could include remedial action, no further action, or identifying the need to rely on another line of evidence to make or support a decision. New data on smallmouth bass appear needed to primarily identify if bass continue to pose a human and ecological risk at the site, and if their concentrations have changed over time. However, the bass do not provide much information on where the contamination is coming from. Based on previous data, less mobile resources (clam, crayfish, and potentially passive samplers) should be used to more specifically identify source areas and further delineate decision units. In the current QAPPs, alternative actions could be designated in a hierarchy approach using lines of evidence to eventually designate when a long-term monitoring plan only is needed, and, eventually, no further action at the site. For example, concentrations above background in bass result in a decision to focus on the less mobile resources lines of evidence to specifically identify sources and refine decision units. Positive results in the less mobile resources lines of evidence results in a decision to delineate smaller decision units around the identified source areas and either remediate those decision units or sample again using less mobile resources to refine the location for remediation. Concentrations below background in the less mobile receptors results in a no further action decision for that decision unit. Deploying a series of clams, crayfish and passive samplers (provided data indicate passive samplers are useful in identifying sources) in this targeted way might be the best method for delineating the smallest decision units that need remediation or further action (and to declare which decision units require no further action). Some examples of alternative actions for the site are provided below in Table 2 (and incorporated in to the decision statement in Step 2 of Table 1).

Determining Background Concentrations
Establishing background concentrations (or comparing an exposed population to a reference population) requires identification and consideration of outliers. Exclusion of outliers is recommended by the U.S Environmental Protection Agency (2015) in their Technical Guidance for ProUCL when evaluating background data. Specifically, Section 1.1 on page 17-18 of the guidance states:

> "Based upon the CSM and regional and expert knowledge about the site, the project team selects background or reference areas. Depending upon the site activities and the pollutants, the background area can be site-specific or a general reference area with conditions comparable to the site before contamination due to site-related activities. An appropriate random sample of independent observations (i.i.d) should be collected from the background area. A defensible background data set represents a "single" environmental population possibly without any outliers. In a background data set, in addition to reporting and/or laboratory errors, statistical outliers may also be present. A few elevated statistical outliers present in a background data set may actually represent potentially contaminated locations belonging to an impacted site area and/or possibly be from other sources; those elevated outliers may not be coming from the background population under evaluation. Since the presence of outliers in a data set tends to yield distorted (poor and misleading) values of the decision making statistics (e.g., UCLs, UPLs and UTLs), elevated outliers should not be included in background data sets and

> estimation of BTVs. The objective here is to compute background statistics based upon a data set which represents the main background population, and does not accommodate the few low probability high outliers (e.g., coming from extreme tails of the data distribution) that may also be present in the sampled data. The occurrence of elevated outliers is common when background samples are collected from various onsite areas (e.g., large Federal Facilities). The proper disposition of outliers, to include or not include them in statistical computations, should be decided by the project team. The project team may want to compute decision statistics with and without the outliers to evaluate the influence of outliers on the decision making statistics."

For smallmouth bass, it is a reasonable assumption that due to their mobility, individuals could frequent areas within the reference area that have elevated concentrations of polychlorinated biphenyls (PCBs) or other COPCs. These individuals would not represent part of the main background population and should be excluded from calculation of a background concentration. Obvious outliers can be identified by data visualization techniques and by testing (U.S. Environmental Protection Agency 2015). However, some potential outliers or data points with strong influence are less easily identified, and the process of excluding these values should be discussed with the Technical Advisory Team. Also, identification and exclusion of outliers in less mobile species (clam and crayfish) from background areas should be discussed with the Technical Advisory Team. For crayfish, the background value is the detection limit for PCBs (based on existing reference area data) so there would be no need to collect reference samples to establish a background unless specific COPCs other than PCBs are of concern and have been detected in the reference area crayfish. Background concentrations can then be used as the action level to compare statistics and determine error tolerances as described in Steps 5 and 6 in Table 1 below.

Rather than using a reference far removed from the site, consider areas where little contamination has been observed within the Forebay as a reference area (or area for calculating a background concentration). As with the reference area, a process to identify and exclude outliers would be needed in order to calculate background. The area around Goose Island should likely be excluded from this analysis as existing data suggest there is a source at Goose Island. At this point, we recommend Goose Island be considered a separate decision unit within the Forebay until it can be determined there is no source at the Island. Further, a background value for PCBs could be calculated from existing data for the tissue matrices, thereby negating the need to collect samples from other areas of either the proposed reference area or the Forebay. This would provide additional funds to increase sampling in the suspected contaminated area along the shores of Bradford Island.

Other Considerations

Crayfish Sampling: As indicated earlier, there would be no need to sample crayfish in the reference area because all values for PCBs in samples from the previous reference area, and in much of the Forebay area, are all below detection limits. Other COPCs may need better characterization in crayfish, but if a background concentration at the detection limit can be agreed upon, then additional analysis for PCBs is unwarranted. Also, this species seems ideal for characterizing very localized sources for PCBs. Consideration should be given to not sampling crayfish at this time and instead increasing the sample size for other tissues. Later, after data on passive samplers and bass and clam tissue are finalized, crayfish can be used to better help pinpoint sources within decision units that have been further delineated using the results from bass, clam, and passive sampler data.

PCB Congeners: Consideration should be given to exclude specific PCB congeners from analysis that have a low frequency of detection. Other hazardous waste sites and PCB investigations typically evaluate only a subset of congeners to calculate a total PCB value. A focus of the proposed investigations should be to decide on a subset of congeners that are representative of the site and can be excluded from further investigations and long-term monitoring plans.

Non-PCB COPCs: The key element of the proposed investigations should be to limit the number of COPCs in tissue to those that are primarily associated with the site. For chlorinated hydrocarbons, consideration should be given to analysis of tissues using high resolution gas chromatography/high resolution mass spectrometry. Although more expensive, this method will greatly improve detection limit capabilities and resolve high detection limit and estimated value concerns observed in previous data collected at the site. Using these methods, COPCs can more confidently be excluded from the site in any future investigation or long-term monitoring plans.

Clam QAPP: For this investigation, will the clams be depurated? It seems that depuration should be consistent with previous investigations at the site. Also, we recommend that clams be shucked by observers on the boat rather than at the laboratory. Some clams retrieved will be dead and tissues replaced by sand, so it may feel heavy and alive but contain no tissue. Shucking and removing the tissue will better guarantee the target mass of 80 grams per sample is obtained. Lastly, section 2.3.1 on page 21 states “Each sample will contain approximately 30 clams and a composite will be made of multiple samples.” This statement is confusing, as it indicates that each composite will be made up of multiple samples containing 30 clams each.

Both QAPPs: Section 4.3.2 in both QAPPs state that an electronic data deliverable from the laboratory is not required. Why not require an electronic data deliverable from the laboratory? It seems this might speed up data interpretation and reduce potential transcription errors.

We appreciate the opportunity to comment on the draft QAPPs. Please contact Jeremy Buck of my staff at 503-231-6975 if you have any questions on these comments.

Sincerely

U.S. Environmental Protection Agency. 2000. Data quality objectives process for hazardous waste site investigations. EPA QA/G-4HW. Office of Environmental Information, Washington, DC.

U.S. Environmental Protection Agency. 2015. ProUCL version 5.1 technical guide: Statistical software for environmental applications for data sets with and without nondetect observations. Final Report EPA/600/R-07/041 prepared by A. Singh and A.K. Singhe, Lockheed Martin/SERAS, Edison, New Jersey for F. Barnett, ORD Site Characterization and Monitoring Technical Support Center, U.S. Environmental Protection Agency, Atlanta, Georgia. Office of Research and Development, Washington, DC.

Table 1. Proposed revisions to Data Quality Objectives						
[HYPERLINK \l "_bookmark0"] State the Problem	**Step 2: Identify the Decision (see following table for decision matrix)**	**Step 3: Identify Information Inputs**	**Step 4: Define the Boundaries of the Study**	**Step 5: Define Decision Rules**	**Step 6: Specify Error Tolerances**	**Step 7: Optimize Sample Design**
In order to confirm that early remediation efforts at the Bradford Island river operational unit (OU) were successful in reducing concentrations of PCBs and other COPCs [or are no longer contributing to concentrations in aquatic organisms], current data regarding concentrations in tissue are needed. In order to determine if PCBs and other COPCs have declined at the river OU, current data regarding concentrations in tissue from the river OU and reference area [or compared to a background concentration] are needed. In order to understand if additional sources of PCBs occur within the river OU, data regarding PCB concentrations less mobile, sediment-associated organisms such as clams and crayfish, and location data on mobile organisms (smallmouth bass) are needed. Note: I inserted some clam PSGs here as an example, but others listed in the clam QAPP may be added. More also could be added here for the movement telemetry data.	Determine whether the river OU contributes PCB or other COPCs to bass body burdens in excess of background levels and requires further source delineation based on other lines of evidence; if not, then rely on bass for long-term monitoring only. Determine whether PCB or other COPC concentrations in bass have remained elevated at the river OU over time and if the OU requires further source delineation based on other lines of evidence; if not, then set up long-term monitoring or equivalency analysis using bass. Determine whether bass location data can help identify sources at the site and delineate decision units that require evaluation using less mobile receptors; if not, use other evidence to establish where source materials are located. Determine whether crayfish prey consumed by bass contain concentrations higher than crayfish otherwise available at the site and if bass movement data help identify sources and delineate decision units; if not, use other lines of evidence to identify source areas. Determine whether PCB or other COPC concentrations in clams exceed background concentrations in a decision unit and require remediation of the decision unit (or further action delineating sources within the decision unit); if not, then declare no further action in decision unit or rely on next line of evidence such as crayfish or passive samplers before declaring no further action.	PCB congener specific data- high quality HRGC/HRMS Aroclor PCBs – GC/ECD (need EPA lab method numbers here). Other COPCs? High variability in previous tissue PCB data- (see box plots submitted by DEQ and USFWS) needs further Data Quality Assessment to identify usability. Outliers in background samples need to be identified. Previous data may not be representative of the population but is reasonable for other CSM purposes. Tissue matrices to be measured are crayfish, smallmouth bass, and clams (*Corbicula*). Background level for PCBs appears to be around 60 to 80 µg/kg for bass based on probability distribution functions (still need agreement on this). Background PCBs for crayfish are the detection limit. Background for clams needs to be determined. Detection limits are listed in QAPP. Precision <20%; Accuracy 75 to 125%.	The spatial boundaries within the site will be defined as decision units (DUs) based on previously sampled data (DUs still need to be refined). Sampled populations will occur within DUs in the north shoreline of Bradford Island, Forebay, Goose Island, possibly other reference area if one of the listed DUs does not suffice for reference. Targeted sampling locations will be selected based on a stratified random grid, with any location changes in the field based on random selection listed in field revision protocols. Whole body tissues will be analyzed (entire bass minus stomach contents which will be purged and archived, entire crayfish, clam minus shell (depurated?). A total of 3 crayfish make up one composite sample, and 20 samples will be collected within each DU (river OU and reference area). A total of 30 clams will make up one composite sample, with 4 samples collected from 3 DUs within the river OU outside the northern shoreline, 30 samples along the northern shoreline (10 separate DUs), and 20 samples within the reference area. Define temporal boundary here- Fall 2020? Practical constraints- ESA permits, flow regime/dam constraints, substrate constraints and tissue samples not occurring at desired location. Scale of decision making- All possible tissue samples within each DU represented by x by x meter of surface area, collected during the fall.	The population parameter of interest will be the true mean as estimated by the one-sided 95% UCL. If the true mean (as estimated.by the 95% UCL calculated using the sample mean) total PCB concentration (and other COPCs) in tissues within each DU is $\geq$ background, then the DU is a source of contamination requiring further delineation or remediation; if not, the DU is not contributing significantly to body burdens and sources of PCBs and other COPCs will be evaluated elsewhere. This can be demonstrated using a one-sample t-test equation, where calculated t = (sample mean – Action Level) / (std. dev / sqrt(n)). If calculated t is less than table value, decide site is clean or not a contributing source. Note: Background values (action level) need to be decided upon for bass, crayfish, clams (and passive samplers once the data are available).	The variability of the environmental variable (COPC) will be evaluated using estimated standard deviations of each constituent for each tissue (from previous data on tissues within or near the DU, or by dividing the upper or lower range of existing data by 2 or 3). The number of samples required from each DU can be estimated as the square root of the standard deviation, or by calculating power curves. The null hypothesis is that the site is contaminated (or each DU continues to act as a contributing source of contaminants (i.e., PCBs). The two types of decision errors are claiming a site or DU is a contributing source when it really isn't, or claiming it is not contributing when it really is. Which decision error has the most severe consequences near the action level? Setting Error tolerances: The alpha error is set to 5%. The beta error is set to 20%. The upper bound of the gray region is the background or action level (such as 80 µg/kg for bass) The lower bound of the gray region is ½ the action level, or calculated based on PDF for total PCBs. This is the value where the consequences of the decision error begin to be significant.	Present alternative designs and determine which are the most cost effective. Different designs will consist of different numbers of samples or changes in other statistical parameters which will increase or decreases costs of sampling. The optimal design will be the least cost method that effectively balances decision errors to tolerable levels. I see this as a "sensitivity" analysis for optimal sample design. This likely can be done by adjusting power curves.

Table 2. Principle Study Questions (PSQs) and Alternative Actions (AAs) matrix table.

PSQ #	PSQ	AA#	AA
1	Are concentrations of PCB and other COPCs in bass at the river OU equal to or higher than the reference site (or background concentration)?	1	Yes – further delineate decision units based on other lines of evidence (crayfish, clams, and passive sampling data), or obtain additional clam or crayfish tissue to help delineate new decision units, and remediate areas where contamination is apparent
		2	No – no further action using the bass line of evidence other than for setting up in long term monitoring plan
2	Have tissue concentrations in bass at the river OU remain elevated or increased over time? Note: this may require a longer term equivalency-type analysis and the question could also be asked: Can variation in concentrations in bass or crayfish be characterized sufficiently to detect changes over time using an equivalency analysis?*	1	Yes – further delineate source of contamination using other tissue lines of evidence
		2	No – set up long-term monitoring or equivalency analysis plan including bass as a line of evidence.
3	Do bass movement patterns indicate where potential exposure to contaminated sediment is occurring at the site?	1	Yes –sample using less mobile resources (clams and crayfish) to confirm sources based on movement patterns
		2	No - use other lines of evidence to establish where source materials are located.
4	Do crayfish consumed by bass contain higher concentrations than crayfish otherwise available to bass?	1	Yes – align prey data with bass movement data to identify source areas and delineate decision units.
		2	No – use other lines of evidence to identify source areas.
5	Do clams equal or exceed background concentrations in the decision unit?	1	Yes – remediate decision unit or conduct further action delineating sources within the decision unit
		2	No – no further action in decision unit (or rely on next line of evidence such as crayfish or passive samplers before declaring no further action)
6	Are there any significant differences in River OU (Site) clam tissue analyte concentrations relative to the reference area?	1	Yes – What does this tell you and what would the action be? It seems that clams and crayfish are much better suited to answer questions from smaller decision units, like in question 7 below.
			No – Still need to look at smaller decision units
7	Are there any significant differences between clam concentrations in subareas of the river OU? [Note: these subareas should be defined as decision units].	1	Yes – remediate decision unit or conduct further action delineating sources within the decision unit
		2	No – no further action in decision unit (or rely on next line of evidence such as crayfish or passive samplers before declaring no further action)
*Note that extreme variation in contaminant concentrations in tissues or other matrices may preclude using classic statistical approaches to answer the PSQ, or may indicate improper selection of decision units (i.e., decision units are too heterogeneous or too inclusive of multiple populations of interest, and the populations should be sampled as distinct populations and considered separately). Populations could be separated and identified separately by looking at previously collected data and decreasing decision unit size to incorporate (potentially) a smaller degree of variation.			